



## Are traditional marketing channels of kinnow really bad?

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Kinnow is being widely cultivated in North-Western part of India comprising the states of Punjab, Haryana and Rajasthan. The analysis of 180 kinnow farmers of three districts of North Western India namely Fazilka and Bathinda districts of Punjab and Sirsa district of Haryana revealed the existence of several marketing channels for marketing of kinnow having varied efficiency levels. Contrary to the believe, the traditional marketing channels (TMC) offered 15 to 19% higher net benefit under the situation of price and yield risk associated with the farms. The efficiency of farms associated with strong value chain finance (TMC) is higher as compared to farms associated with the weak value chain finance comprising the emerging marketing channels (EMC). These facts explain the continued faith of farms in the TMC as revealed by the proportion of farms supplying their produce through different market channels. The study advocates the need for evolution of newer forms of marketing channels and also co-existence of all as each has its own merits and demerits. The study offers suggestions for strengthening of kinnow value chain so that all the stakeholders are benefited. The collectivization of farmers in the form of farmer producer organization, availability of technology from various governmental and non-governmental institutions, the effective implementation of e-marketing app, evolution of crop insurance scheme and price stabilization fund for risk reduction are strategies to improve the kinnow value chain.

**Keywords:** Kinnow value chain, Marketing efficiency, Modern marketing channel, Traditional marketing channel, Value chain financing

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Kinnow is being widely cultivated in North-Western part of India comprising the states of Punjab, Haryana and Rajasthan. It is important foreign exchange earning crop in view of its growing exports to the countries like Bangladesh, Saudi Arabia, Russia, Iran, Bahrain, Singapore, Nepal, Switzerland, Kuwait, Sri Lanka, Qatar, etc<sup>1</sup>. It is proving out to be an important intervention crop to wean away the farmers from traditional rice-wheat cropping system which is deteriorating the soil health leading to stagnation in productivity. Several marketing models are in practice in Punjab for marketing of kinnow, which vary in efficiency. It is observed that kinnow growers realise lower return by selling produce to pre-harvest contractors while, it is higher on direct marketing<sup>2-4</sup>. The emerging marketing channels (EMC) of kinnow involving modern retail chains provide 20% higher price than that in traditional marketing channel (TMC) involving pre harvest contractors<sup>5</sup>. The share

of kinnow growers in the price paid by consumer under TMC is 33.70% while, the same in case of EMC is 55%. Several studies on fresh fruit and vegetable retail chains in India have confirmed the relative advantage to farmers connected with organized retail chains. The organized retail chains offer higher prices<sup>6-8</sup>, higher net profits<sup>9,10</sup> and lower transaction costs<sup>11</sup>. The supermarket channels are found to be more efficient than the traditional channels<sup>12</sup>. A few retail chain initiatives are backed by extension services, including demonstration plots and advice on crop calendars and cultivation techniques and practices, as well as cold chain support and other marketing services<sup>13</sup>. However, the modern marketing channels pose a number of constraints like problems in terms of rejections of low grade produce, procurement according to indent and lack of knowledge of grading<sup>12</sup>. Often these organized food retail ventures are involved in procurement arrangements without any contract or commitment<sup>8</sup>. The concern is also raised about the small farmers

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being left behind in the supermarket driven horticultural marketing channel<sup>14,15</sup>. The companies prefer to work with medium and large scale growers, thus exacerbating rural inequalities<sup>16-18</sup>. The traditional marketing channels characterised by large number of intermediaries is stated to be low in efficiency and efforts have been made to reduce the number of intermediaries through promotion of Ryuth Bazar, Shetakari Bazar, Uzhavar Sandhai, Apni Mandi, Krushak Bazar and now the government initiative of creation of e-mandi<sup>19-21</sup>. It is however observed that despite the number of innovations and marketing reforms the number of farmers depending on the traditional marketing channel is still quite large. Efforts should be made towards provisioning of various options for the goods to move from producers to consumers so that the competition across the marketing channels helps to enhance the efficiency. Thus the coexistence of various kinds of marketing channels when blended with right kind of policies, use of technology, and market infrastructure would bring about greater welfare. Therefore, it is important to focus our efforts towards strengthening of kinnow value chain, so that better price is realized by the farmers and produce reaches the consumer in better shape and quality. Financing the value chains plays an important role in strengthening the value chains. Therefore, the study has been undertaken with the following specific objectives: (a) to evaluate the marketing efficiency across the prevailing marketing channels of kinnow; (b) to assess the perception of stakeholders of various marketing channel for access to credit; and (c) to analyse the impact of value chain financing on profitability and efficiency of farmers.

**Methodology**

Primary survey for this study was conducted in three districts of North Western part of India namely, Fazilka and Bathinda districts of Punjab and Sirsa district of Haryana that were purposively selected on account of highest area under kinnow cultivation. Then, one block was randomly selected from each of the selected districts. From each selected block, further two clusters of villages comprising two to three villages were selected randomly. From each of the cluster of villages, 30 farmers were interviewed. Thus, a total of 180 sample farmers were selected for this study. Apart from growers, we also surveyed 30 pre-harvest contractors, 15 wholesalers, 20 retailers, 10 co-operatives and 10 processors to

elucidate the marketing cost, returns and perceptions about the financial institutions (Table 1).

The marketing efficiency of different marketing channels was analyzed by using the following methods.

*Producer's price (P<sub>f</sub>)*

$$P_f = P_a - C_f \quad \dots (1)$$

Where,

P<sub>a</sub> = Wholesale price in primary assembling market

C<sub>f</sub> = Marketing cost incurred by farmer

*Producer's share in the consumer's rupee (P<sub>s</sub>)*

$$P_s = \frac{P_f}{P_r} * 100 \quad \dots (2)$$

Where,

P<sub>f</sub> = Price received by the farmer

P<sub>r</sub> = Retail price (consumer price)

*Total cost of marketing (C)*

$$C = C_f + \sum C_{mi} \quad \dots (3)$$

Where,

C<sub>f</sub> = Cost incurred by farmer

C<sub>mi</sub> = Cost incurred by i<sup>th</sup> middle man

*Acharya's modified marketing efficiency (ME)*

$$ME = \frac{FP}{(MC + MM)} \quad \dots (4)$$

Where,

FP = Net price received by farmer for kinnow

MC = Total marketing costs

MM = Total net margins of intermediaries

Table 1 — Details of samples selected for the study of kinnow value chain

Stakeholders	Sample size	Study area
Producers	180	Fazilka, Bathinda, Sirsa
Pre harvest contractor	30	Fazilka, Bathinda, Sirsa
Wholesalers	15	Fazilka, Bathinda, Sirsa, Delhi
Retailers	20	Fazilka, Bathinda, Sirsa, Delhi
Co-operative/Bank	10	Fazilka, Bathinda, Sirsa
Institution/Processor	10	Fazilka, Bathinda, Sirsa
Total number of samples	265	

*Conventional method*

$$\text{Marketing efficiency} = \frac{(P_c - P_f)}{MC} \dots (5)$$

Where,

$P_c$  = Consumer purchase price

$P_f$  = Producer selling price

MC= Total marketing costs

*Shepherd approach (Shepherd, 1965):*

The marketing efficiency is the ratio of the total value of goods marketed to the total marketing cost, which is given below

$$\text{Marketing efficiency} = \frac{\text{Consumer purchase price } (P_c)}{\text{Total marketing costs } (M_c)} \dots (6)$$

*Composite index method*

In this method marketing efficiency is calculated by using the rankings of various performance indicators<sup>22</sup>. The indicators included were producer share in consume rupees, marketing cost of intermediaries, marketing margin of intermediaries, return per rupees of investment, Acharya’s method and Shepherd approach. The average of the rankings of various performance indicators gives the cumulative ranking of marketing channels:

Marketing efficiency of marketing channel ( $ME_i$ )

$$= \frac{\sum_{j=1}^n R_{ij}}{n} \dots (7)$$

Where,

$R_{ij}$ = rank of the marketing channel ‘j’ as per performance indicator ‘i’

‘j’= performance indicator ranging from 1 to 7

‘i’= marketing channel ranging from 1 to 4

*Stakeholder’s perception regarding access to credit*

Ease of accessing credit for market intermediary

$$(EACMI_{kj}) = \sum_{i=1}^5 \frac{P_i}{5} \dots (8)$$

Weighted ease of accessing credit (WEAC<sub>j</sub>)

$$= \frac{\sum_k^4 = 1^n k * EACMI_{kj}}{\sum_k^4 = 1^n k} \dots (9)$$

Where,

$P$  = perception of  $k^{th}$  market intermediary about access to credit from financial intermediaries ranging from 1 to 5 (increasing order of difficulty)

‘n’ = no. of individuals in  $k^{th}$  market intermediary ( $k_1=180$  for farmers;  $k_2=30$  from post-harvest contractor;  $k_3=15$  for wholesalers;  $k_4=20$  for retailers)

‘j’=financial institutions (1= banks, 2= post-harvest contractors; 3= adhatiya; 4= wholesalers; 5=retailers)

‘k’=market intermediary (1= farmer; 2= post-harvest contractor; 3= wholesaler; 4= retailer)

‘i’= criteria for assessing ease of accessing credit

*Technical efficiency*

To estimate the technical efficiency (TE), the linear programming model is expressed as:

$$\text{Min}_{\theta, \lambda} \theta,$$

$$\text{Subject to - } y_i + Y\lambda \geq 0,$$

$$\theta x_i - X\lambda \geq 0, \dots (10)$$

Where  $\theta$  is a scalar and  $\lambda$  is a  $N \times 1$  vector of constraints. This envelopment form involves fewer constraints than the multiplier form [ $(K+M) < (N+1)$ ], the value of  $\theta$  is the efficiency score for the  $i^{th}$  sample farms. It will satisfy  $\theta \leq 1$ , with a value of 1 indicating a point on the frontier and hence technically efficient sample farm.

To calculate cost efficiency, prices of all the inputs were used to study the behavioral objective, such as cost minimization or profit maximization. For this, the mathematical form of cost minimization data envelopment analysis (DEA) as represented in equation (11) can be used

$$\text{Min } \lambda_{xi} * w_i * x_i^*,$$

$$\text{Subject to- } y_i + Y\lambda \geq 0,$$

$$x_i^* - X\lambda \geq 0,$$

$$\lambda \geq 0, \dots (11)$$

Where,  $w_i$  is a vector of input prices for the  $i^{th}$  sample farms and  $x_i^*$  is the cost minimizing vector of input quantities for the  $i^{th}$  sample farms, given the input price  $w_i$  and the output level  $y_i$ . The total cost efficiency (CE) or economic efficiency of the  $i^{th}$  sample farms is calculated by equation (12)

$$CE = \frac{w_i'x_i^*}{w_i'x_i} \dots (12)$$

It is the ratio of minimum cost and observed cost. The allocative efficiency (AE) can be calculated as:

$$AE=CE/TE$$

Data envelopment analysis was performed using DEAP Software v. 2.1 (Coelli T.J of Department of Econometrics, University of New England, Australia).

**Results and discussion**

Value chain describes the arrival of kinnow from producer to consumer through various marketing channels. Five value chains are found to exist in the study area; through which kinnow reaches market and eventually to consumers (Table 2).

The marketing channel comprising “Producer-pre-harvest contractor-wholesaler-retailer-consumer” is the most dominant and is practiced by 70% of

farmers. A new innovative channel has emerged i.e., ‘Producer - modern retail outlet- consumer’ is emerging channel and accounts for a meager proportion of farmers (2%). This can be attributed to the demand of quality produce by the modern retailers. In channel-IV, farmers are found to be selling directly to consumers and it accounts for 5% of farmers. In channel III farmers directly take their produce to the market (APMC) and sell to whole seller, it accounts for 10% of total farmers.

It is observed from the Table 3 that per quintal marketing cost in MC I, MCII and MC III was Rs.477, Rs.235 and Rs.442, respectively. While the producers share in consumers rupees in the same were 32%, 36% and 41%, respectively. Under marketing channel V the producer's share in consumer's rupee was found to be 100%, while the marketing cost was lowest among the four marketing channels. In marketing channel IV the producer's share in consumer's rupee is 48%, while the marketing cost

Table 2 — Flow chart of major value chain prevailing in the study area

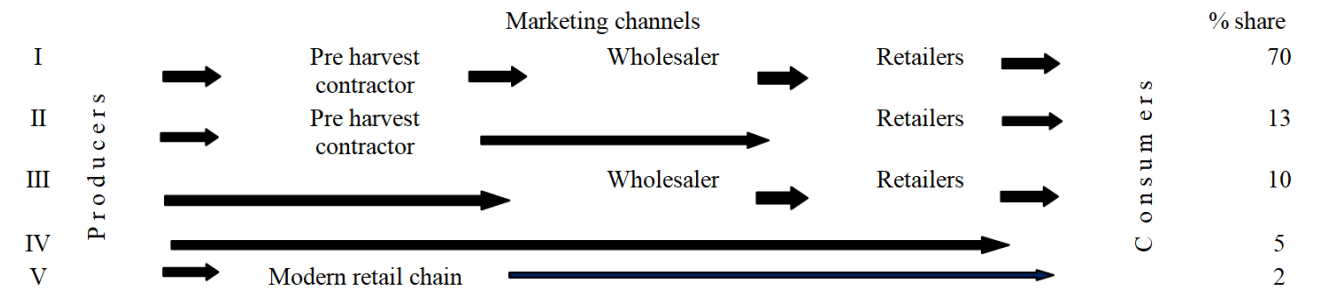


Table 3 — Price spread of kinnow under different market channels (Rs./quintal)

S. No.	Particulars	Channel I	Channel II	Channel III	Channel IV	Channel V
A 1	Price received by farmers	990	990	1288	1485	1550
2	Marketing cost of producer	-	-	155.66	142.27	123.77
3	Net price or margin of producer	990	990	1132.34	1342.73	1426.23
B 1	Purchase price of pre harvest contractor	990	990	-	-	-
2	Marketing cost of pre harvest contractor	157.59	155.66	-	-	-
3	Sale price of pre harvest contractor	1660	2780	-	-	-
4	Net margin of pre harvest contractor	512.41	1608.15	-	-	-
C 1	Purchase price of wholesaler	1660	-	1288	-	-
2	Sale price of wholesaler	2335	-	2335	-	-
3	Marketing cost of wholesaler	222.93	-	189.45	-	-
4	Net margin of wholesaler	1437.07	-	800.79	-	-
D 1	Purchase price of retailers	2335	2335	2335	1485	-
2	Cost incurred by retailers	96.49	72.95	96.49	80.92	-
3	Sale price of retailers	3115	2780	3115	3050	-
4	Net margin of retailers	683.51	372.05	683.51	1404	-
E 1	Purchase price of consumers	3115	2780	3115	3050	1550
2	Producer share in consumer rupees	31.78	35.61	41.34	48.68	100
3	Total marketing cost	477.01	235.38	441.60	223.19	123.77

Table 4 — Marketing efficiency of kinnow under different marketing channels

Particular	Channel I	Channel II	Channel III	Channel IV	Channel V
Conventional approach	4.45(ii)	7.60(iv)	4.49(iii)	7.65(v)	1(i)
Shepherd approach	6.53(v)	11.81(iii)	7.05(iv)	13.67(i)	12.52(ii)
Acharya approach	0.32(v)	0.45(iii)	0.58(iv)	0.83(ii)	0.92(i)
Producers share in consumers rupee (%)	31.78(v)	35.61(iv)	41.34(iii)	48.68(ii)	100.0(i)
Total marketing cost (Rs/q)	477.01(v)	235.38(iii)	441.6(iv)	223.19(ii)	123.77(i)
Total net margin of intermediaries (Rs/q)	2632.99(v)	1980.2(iii)	2616.64(iv)	1404(i)	1426.23(ii)
Rate of return (MM/MC)	5.52(iv)	8.41(i)	5.93(ii)	6.29(v)	11.52(iii)
Total score	31	21	24	18	11
Mean score	4.43	3.0	3.43	2.57	1.57
Aggregate rank	V	III	IV	II	I

was lowest among the MC I, MC II and MCIII. It is evident from the table that more is the number of intermediaries in the value chain, lesser is the producer's share in consumer's rupee, marketing efficiency and vice versa<sup>23</sup>.

#### Marketing efficiency of value chain

The marketing efficiency of all the channels was calculated using various methods. The conventional approach, which is the ratio of price spread to total marketing cost in delivering the product to final consumer, indicates channel V as the most efficient with index value of one followed by channel I, III, II and IV (Table 4).

The marketing efficiency of channel IV (13.67) is greater than that of other existing channels under the Shepherd approach. While, channel I (6.53) is the least efficient. In this approach marketing efficiency is directly related to consumer's purchase price and is inversely related to marketing cost. Channel IV is related to involvement of modern retail outlet like SAFAL which is managed by employing the modern business principle; they use latest technology for cleaning, processing, storage and transportation of produce they handle. The marketing channel V and Channel IV are more efficient channels following Acharya approach, because in these channels marketing margin and marketing cost are less compared to that in other channels. Thus, it is observed that the ranking of the marketing channels varies with the method used. In order to have a unique ranking a composite ranking using all the methods is computed. The channel with least score is considered as the most efficient channel. Channel V has emerged as the most efficient channel followed by the channel III, II and I.

The ease of accessing credit from different stakeholders of the kinnow value chains were evaluated and presented in Table 5. The criteria used

Table 5 — Perception of farmers' regarding access to credit from different institutions

Criteria	Bank	Post-harvest contractor	Adatiya Wholesaler	Relative/Moneylender	
<b>Farmer's</b>					
Paper work	1.39	0.26	0.17	0.32	
Accessibility	1.39	1.44	0.12	0.11	
Flexibility	0.83	0.22	0.34	0.22	
Sufficiency	1.78	0.93	0.37	0.07	
Rate of Interest	0.27	0.44	1.11	0.97	
Average score	1.13	0.66	0.42	0.34	
<b>Pre harvest contractor</b>					
Paper work	1.20		0.27	0.67	
Accessibility	1.00		0.80	0.80	
Flexibility	0.90		1.10	1.00	
Sufficiency	1.20		0.50	1.30	
Rate of Interest	0.43		0.80	0.90	
Average score	0.95		0.69	0.93	
<b>Wholesaler</b>					
Paper work	1.87			1.07	
Accessibility	1.20			1.20	
Flexibility	2.00			0.67	
Sufficiency	2.20			0.53	
Rate of Interest	0.40			3.00	
Average score	1.53			1.29	
<b>Retailer</b>					
Paper work	3.00		0.40	1.00	
Accessibility	1.50		1.35	2.20	
Flexibility	0.80		1.60	2.10	
Sufficiency	1.00		2.00	1.80	
Rate of Interest	1.60		0.60	0.50	
Average score	1.58		1.19	1.52	
Ease of access score (cumulative)	1.17	0.66	0.42	0.89	0.57

Note: Higher the score, higher the level of difficulty

for evaluation of ease of accessing credit were paper work, accessibility, flexibility, sufficiency and rate of interest. The stakeholders were asked to rank from 1 to 5 reflecting increasing order of difficulty.

It is revealed that among all the sources of availing credit within the kinnow value chain the banks are the most difficult. The pre-harvest contractors/ adatiyas are the easiest to approach for availing credit followed by relatives & money lenders and wholesalers. The pre-harvest contractors find the wholesalers to be easier a source to depend on for availing credit followed by the relatives/ money lenders and banks. The wholesalers also perceive the relatives/ money lenders to be easier a source to avail loans followed by banks. The retailers find wholesalers as easier source to gain finance followed by relatives / money lenders and banks. Thus there is close inter-linkage among the kinnow value chain stakeholders for accessing credit. This binds the kinnow value chain stakeholders and facilitates the easy movement of kinnow from producer to consumer. The availability of finance helps the kinnow value chain to perform multifunctional activities starting from production, harvesting, grading, cleaning, waxing, transportation, storage, processing, and finally making it available to consumers located in far off markets. Looking at the important role played by the pre-harvest contractor (PHC) in making available the credit to the major stakeholders of the kinnow value chain i.e., the farmers, the kinnow value chains involving the PHC is considered to be strong value chain and others as relatively weak value chains.

The impact of value chain financing on profitability of kinnow cultivation is depicted in Table 6. It is revealed that the net benefit

(Rs 2.45 lakh) obtained in strong value chain financing is quite lower than that in the weak value chain financing (Rs 2.59 lakh). This is because the farmers associated with weak value chain financing sell their produce at higher price as compared to the value chain involving PHC. The PHC undertakes part of operation & maintenance activity of orchard there by reducing the production costs. Therefore, even though in strong value chain financing the gross income is less but the net income per rupees of investment is very high (Rs 6.33) as compared to that in weak value chain financing (Rs 2.67). The yield is higher (284 quintal per ha) in strong value chain financing, which is mainly due to the advance payments received from the pre-harvest contractor enables them to manage the orchard much better. Thus, the net benefit per rupees of investment is higher in strong value chain financing, because they incurred lower operational and marketing cost.

The Table 7 shows the advantage and disadvantage of strong and weak value chain financing in the study area. Most of farmers lease out orchards to PHCs. The farmers generally prefer to lease out their orchards to PHCs to overcome risk in price and yield. Besides these, timely sale of produce, availability of time for other works, rising wages, shortage of labour, assured income in advance, higher transportation cost, higher marketing cost, overcoming the risk of loss due to spoilage and due to bad weather were found to be the other advantages reported by the farmers. The major disadvantage of strong value chain financing are realization of lesser price of produce, poor bargaining power of farmers and often breach of contract.

The profitability of kinnow is influenced not only by the choice of kinnow value chain but also by the price and yield risk. The price risk has been evaluated for major markets of kinnow by taking the mean daily prices for the period 2010-2017 and is depicted in Table 8. The instability index of kinnow price ranges from 12% for Chandigarh market to 18.49% for Barnala market. The yield risk associated with kinnow was computed by taking the productivity for the period 2004-05 to 2014-15 for major districts of Punjab and is given in Table 9. It is observed that the average yield risk is 2.5% and it ranged from 0.7% for Muktasar to 4% for Ferozepur district of Punjab. Thus it is observed that the kinnow farmer is impacted more by price risk and to a lesser degree by yield risk. In the Table 10, the profitability of kinnow under price and yield risk in weak value chain financing is

Table 6 — Impact of value chain financing on profitability of kinnow

Particular	Strong Value chain financing (Marketing channels I & II)	Weak value chain financing (Marketing channels III to V)
Yield (q/ha)	284	256
Price (Rs)	990	1389
Gross income (Rs)	281160	355584
Operational cost (Rs)	38680	52678
Marketing cost (Rs)	0	44288
Interest on advance (Rs)	2460	0
Net Benefit (Rs)	24940	258618
Net Benefit per rupee of investment (B:C ratio)	6.33	2.67

Table 7 — Impact of value chain financing

Particular	Advantage	Disadvantage
Strong value chain	<ul style="list-style-type: none"> <li>• Receipt of money in advance</li> <li>• Less price and yield risk</li> <li>• Adoption of new technology</li> <li>• Reduced labor, harvesting and marketing expenditure</li> </ul>	<ul style="list-style-type: none"> <li>• Price realized is low</li> <li>• Often contract fails</li> </ul>
Weak value chain	<ul style="list-style-type: none"> <li>• Realization of better price</li> </ul>	<ul style="list-style-type: none"> <li>• Price risk</li> <li>• Yield risk</li> <li>• Marketing risk</li> <li>• Unavailability of labour</li> </ul>

Table 8 — Instability and average daily kinnow prices of major markets for period 2010-2017

Market	Observation No.	Mean of Kinnow price	Std. Dev.	Min.	Max.	CV (%)	Instability* (%)
Fazilka	1154	1247	343	550	2500	28	14.00
Amritsar	1154	1241	478	125	4000	39	12.02
Jalandhar	1154	998	319	500	2506	32	15.99
Ludhiana	1154	1206	436	700	3960	36	17.98
Barnala	1154	1339	501	300	5000	37	18.49
Chandigarh	1154	1745	416	200	5937	24	12.00
Delhi	1154	1966	613	800	5777	31	15.50

Source: www.agmarknet.nic.in; Note: \*Instability is computed using Cuddy dela vale index

Table 9 — Productivity pattern of Kinnow in Punjab

	Hosiyarpur	Ferozepur	Bathinda	Mukatsar	Others	Total
Productivity (t/ha)						
2006-07 TE	16	16	15	16	18	18
2014-15 TE	22	23	20	22	11	23
CGAR (%)	4.3	4.8	3.2	4.3		3.2
Instability (%)	0.9	4	0.7	4		2.5

Source: GoP (2016)

Table 10 — Impact of value chain financing on Profitability

Particular	Strong value chain financing	Weak value chain financing under different scenario		
		*Price reduction by 14%	**Yield reduction by 4 %	Combined effect of reduction in Price (14%) & yield (4%)
Yield (q/ha)	284	256	245.8	245.8
Price (Rs)	990	1195	1389	1195
Gross income (Rs)	281160	305920	341416	293731
Operational cost (Rs)	38680	52678	52678	52678
Marketing cost (Rs)	0	44288	44288	44288
Interest on advances (Rs)	2460	0	0	0
Net Benefit (Rs)	244940	208954	244450	196765
NB per rupee of investment	6.33	2.15	2.52	2.03

Note: \*Price instability of kinnow market of Fazilka (Table 8) & \*\*yield instability of Ferozepur district was taken as it represents major kinnow production region of Punjab (Table 9).

depicted. In normal condition the net benefit under weak value chain financing is higher (Table 6). If the farmer faces price reduction by 14%, then the net benefit falls to Rs 208954 which is 14.69% lower

than under strong value chain financing. If both price and yield loss occurs simultaneously, then the net benefit falls to Rs 196765 which is 19.67% lower.

*Impact of value chain financing on efficiency*

The Table 11 shows the impact of value chain financing on the efficiency of kinnow cultivars. Average value of overall technical efficiency (which reflect the ability of using suitable configuration (managerial ability of farmers) and level of input uses on efficient scale of farm size), pure technical efficiency (which indicate only the ability of managerial skill of farmers) and scale efficiency (which indicates optimum size of a farm) shows that strong linked value chain financing are more efficient than weak linked value chain financing.

The technical efficiency (74%) is higher in strongly linked value chain financing compared to financially weak linked farmers (71%). This is due to better management of orchard. It reduces the managerial role of farmers in the field. So he can better manage the orchard. The pure technical efficiency (88%) of strong linked value chain farmers are also high which

shows that the financially strong linked value chain farmers manage their orchard better compared to financially weak linked farmers with optimum scale of operations at their orchard.

*Suggestion to improve kinnow value chain*

The value chain financing describes the flow of credit between the value chain stakeholders either from internal source or outside agencies. A number of agencies are involved in enhancing the efficiency of kinnow value chain by way of provisioning of extension service, technology, marketing support, and credit. The producer is the main stakeholder in the value chain. The institutions like banks, NGO, NABARD, SFAL, ITC, insurance company, government agency, private traders and other institutions help to strengthen the value chain and value chain financing. The financial linkage among the value chain stakeholders makes the value chain strong. Strong value chain provides the stable income to the value chain stakeholders and enables the passage of quality product from producer to consumer. Along this value chain path a few interventions are there to improve the value chain financing which are depicted in Figure 1 and the same is described below.

Table 11 — Impact of value chain financing on efficiency

	Strong value chain	Weak value chain
Overall technical efficiency	0.74	0.71
Pure efficiency	0.88	0.84
Scale efficiency	0.87	0.82

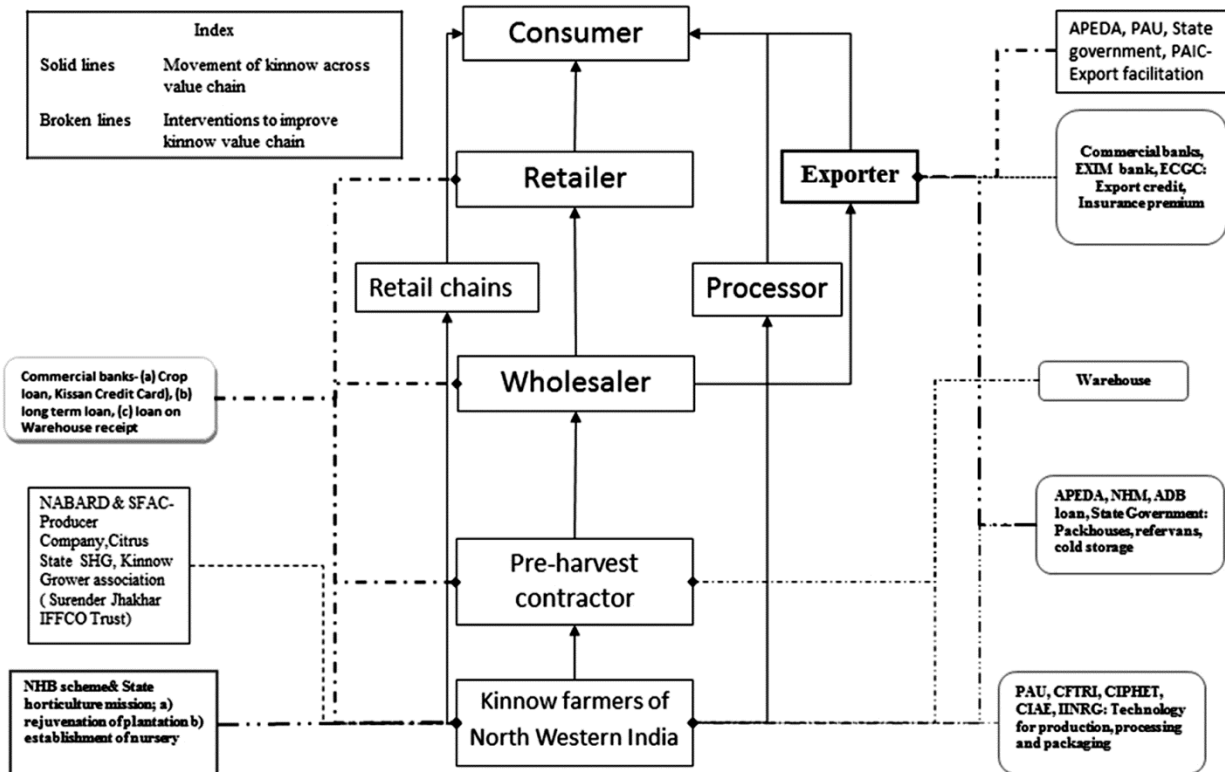


Fig. 1 — Mapping of Kinnow value chain



### *Demonstration of technology*

a) Public-private initiative for demonstration of citrus technology

Punjab Agri Export Corporation (Pagrexco) and PepsiCo have set up a 9,600 sq ft greenhouse at Agricultural Research and Development Centre at Jallowal near Jalandhar. Citrus stocks will be raised in environment-controlled greenhouse to allow budding and grafting operations to proceed round the year. The citrus trees will be taken up on eight demonstration plots (Ludhiana, Bahadurgarh, Gangian, Gurdaspur, Abohar, Khanaura (Hoshiarpur), Attari (Amritsar) and Majra (Ropar) in Punjab) to demonstrate new citrus cultivation technology for the benefit of farmers<sup>24</sup>. Policy support is essential for strengthening of kinnow value chain. The policy hurdle is preventing the Punjab farmers from getting new tube well connections for drip irrigation by Punjab State Power Corporation. The National Green Tribunal (NGT) has directed the state government to maintain status quo on issuing 70,000 new connections in view of the falling ground water table<sup>25</sup>.

b) Citrus grower association

With the objectives of improving quality and productivity of citrus at minimal costs in its “Natural Growing Areas”, the State Government has established five citrus estates viz. Abohar, Tahliwala Jattan (District Feroepur), Badal (District Sri Mukatsar Sahib), Hoshiarpur, Bhunga (District Hoshiarpur). Citrus grower associations are formed within an area of 20 km radius for each citrus estate, so that the world class infrastructural and other facilities may be provided to the farmers which can

enhance their profitability leading to expansion of area under this crop<sup>26</sup>. The major function performed by the citrus grower association is described in Table 12. A number of extension functions are performed by citrus growers association. However, there is a need to strengthen the citrus grower association for betterment of kinnow growers.

c) Other institutions working for technology development and dissemination

There are a number of institutions which are working for development of kinnow farmer's through different activities which are described in Table 13. These institutions help in improvement of orchard management practices, process for production of value added products, develop new varieties and provide financial help to adopt better equipment and orchard development<sup>27-31</sup>. The lac based coating of kinnow fruit which consists of dissolving dewaxed decolourised lac (DDL) in solubilizing agent has been developed by Indian Institute of Natural Resins and Gums<sup>32</sup>. The state government has created six washing, grading, waxing plants at Hoshiarpur, Fazilka and Muktsar. One pack house equipped with cold rooms and pre-cooling unit is established at Badal<sup>33</sup>. The kinnow farmers need to take benefit of these infrastructural facilities for achieving higher price of the produce.

Surender Jhakhhar IFFCo trust is working in Punjab, Rajasthan and Haryana. It provides extension services and marketing of kinnow<sup>34</sup>. The major activities taken up by the trust are presented in the Table 14. The area of operation of the trust covers large proportion of kinnow production zone. The trust should form farmer producer organization, so that small and medium farmers can get better price for their produce by adopting better marketing and financial facilities. They should evolve like e-choupal which has enhanced the decision-making power of farmers, as they know the sale price for the produce even before it leaves the village. It has linked the farmers to global market<sup>35</sup>.

### *Developed organised marketing system and post harvest infrastructure*

The government should assess critical gaps in marketing of kinnow, in terms of requirement of cold storage, packaging, grading and cold chain transportation infrastructure, etc. The government should consider creating kinnow brand and sell through its own retail outlets, and also tie up with organised retailers/ processors. It is estimated that India has a shortage of reefer transportation vehicles-

Table 12 — Major functions performed by the citrus grower association

Major intervention	Major activities	Impact on farmers	Suggestion to improve
Extension service	Expert technical service, Agri clinic, leaf and soil testing etc	Farmers gets better package of practices	Coverage of farmers should be increased, human resource should be increased
Marketing	Latest marketing practices, packaging materials	Improve the marketing efficiency of farmers	To insure the price stability and price forecasting
Custom hiring	Mechanical pruner, sprayer, rotavator, etc	Reduce time and labor cost	Coverage of farmers should be increased

Table 13 — Major activities taken by different institution

Institution	Major activities	Impact on farmers	Suggestion to improve
CIPHET , Ludhiana	<ul style="list-style-type: none"> <li>• Machinery for processing, pruning, cleaning and grading</li> <li>• Value added product of kinnow</li> <li>• Entrepreneurship development programme</li> <li>• Custom hiring of machines</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce time of operation</li> <li>• Increase value of kinnow</li> <li>• Increase in profit</li> </ul>	<ul style="list-style-type: none"> <li>• Subsidy to procure machine</li> <li>• Generate awareness about machines</li> </ul>
Punjab Agriculture University, Ludhiana	<ul style="list-style-type: none"> <li>• Seedless variety and dwarf variety</li> <li>• Planting materials</li> <li>• Training to farmers</li> <li>• Demonstration of new technology</li> </ul>	<ul style="list-style-type: none"> <li>• Virus free planting material</li> <li>• Technical knowhow</li> <li>• Increase in market share</li> </ul>	<ul style="list-style-type: none"> <li>• More number of nurseries need to be established</li> </ul>
Indian Agricultural Research Institute, New Delhi	<ul style="list-style-type: none"> <li>• Varietal development</li> <li>• Package of practices of kinnow</li> </ul>	<ul style="list-style-type: none"> <li>• Higher yield</li> </ul>	<ul style="list-style-type: none"> <li>• Planting materials should be provided</li> <li>• Develop better management practices</li> </ul>
Krishi Vigyan Kendras	<ul style="list-style-type: none"> <li>• Extension activities</li> <li>• Training on package of practices</li> <li>• Training on processing and value addition</li> </ul>	<ul style="list-style-type: none"> <li>• Technical knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Small farmers be given more opportunity</li> </ul>
State Horticulture Department	<ul style="list-style-type: none"> <li>• Providing financial help to increase area under kinnow</li> <li>• Exposure visit for farmers</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce orchard establishment cost</li> <li>• Awareness about better management practices</li> </ul>	<ul style="list-style-type: none"> <li>• A number of farmers should be benefitted</li> <li>• Awareness about financial product by visiting processing plants</li> </ul>

Table 14 — Major activities done by Surender Jhakkhar IFFCo trust

Major intervention	Major activities	Impact on farmers	Suggestion to improve
Extension service	<ul style="list-style-type: none"> <li>• Soil testing</li> <li>• Price update</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction in cost of fertilizer</li> <li>• Better price realization</li> </ul>	<ul style="list-style-type: none"> <li>• Increase in number of technical person</li> </ul>
Marketing	<ul style="list-style-type: none"> <li>• Market access to small &amp; medium farmers and to new kinnow growers</li> </ul>	<ul style="list-style-type: none"> <li>• Improved barging power of small and medium farmers</li> <li>• Better price realization</li> </ul>	<ul style="list-style-type: none"> <li>• It should work for forming farmers producer organization</li> </ul>
Input provider	<ul style="list-style-type: none"> <li>• Planting materials</li> <li>• Other inputs</li> </ul>	<ul style="list-style-type: none"> <li>• Tie up with KRIFCo, for timely supply of fertilizer</li> </ul>	<ul style="list-style-type: none"> <li>• Nursery should be better managed to serve large number of farmers</li> </ul>
Other	<ul style="list-style-type: none"> <li>• Organizing kinnow festival, kinnow day, seminar on kinnow at farmers field</li> </ul>	<ul style="list-style-type: none"> <li>• Creates awareness about diseases, pest, new technology, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Financial help on easy terms be provided to expand activities</li> </ul>
Linkage	<ul style="list-style-type: none"> <li>• Serve as linkage between farmers and Pre-harvest contractor / wholesaler</li> </ul>	<ul style="list-style-type: none"> <li>• Farmers bargaining power is enhanced</li> <li>• Risk reduction</li> </ul>	<ul style="list-style-type: none"> <li>• More number of farmers should become members</li> </ul>

having fewer than 10,000 vehicles as against an estimated 62,000 vehicles. A complete cold chain solution requires investing in pre-cooling and cold storage, in refrigerated vehicles for transporting food and in the refrigerated distribution centers. The investment in supply chain for kinnow considering aggregation takes place at Abohar, Punjab and is supplied to Bangalore, Karnataka can benefit all the stakeholders. The payback period of such an investment in cold chain comes down from 16 years without kinnow to 9 years with kinnow. The transporter makes an annual profit of Rs 12.5 lakhs

from investment of Rs 29.5 lakhs, giving him a payback period of 4 years. The profit of distributor increases four folds, the retailers margin increases from 1% to 7.45% while the aggregators margin increases from 2% to 20% when he supplies during offseason<sup>36</sup>. The need is to provide sufficient incentives for attracting greater investment in infrastructure.

The Punjab Agro Industries Corporation (PAIC) has been working on 'post-harvest fungicide laden wax technique of international standard' to maintain the quality of 'Kinnow' for a longer time. Also, the

PAIC officials are in the process of consulting with the top companies running cold chains on international levels. It is working to import citrus fruit clippers and harvesting bags, besides providing specialized training to labours engaged in fruit picking in the orchards. The Railway Ministry had been requested to provide refrigerated wagons from Abohar, Bathinda and Hoshiarpur railway stations, thereby covering the 'Kinnow' hubs of the state. The participation of progressive kinnow growers in international fruit trade fairs especially one of the biggest trade fair in Russia is being facilitated<sup>37</sup>. To facilitate better market access to kinnow farmers of Hoshiarpur and Abohar region of Punjab, the Punjab Agro Industrial Corporation (PAIC) has launched 'e-marketing app'<sup>38</sup>.

Punjab Agro Juices Limited was established at Hoshiarpur and Abohar in 2006. These plants are first of its kind in the world to process different varieties of citrus as well as tropical fruits and vegetables like tomato, carrot, melon, mango, guava, pear, sweet gourd, bitter gourd, aloe vera, amla, etc. These plants are equipped with switching mechanism from one raw material to another in 4-5 hours. These plants have facility of de-bittering in fruit juices such as Kinnow & Mosambi. The small size fruits are used up for processing purpose leaving the large sized fruits to enter into the market. The small volume of produce entering in the market jacks up the price leading to better realization of price for the crop. There is a need for establishing kinnow processing industries for development of value-added ready-to-serve (RTS) quality products, minimizing post-harvest losses and providing remunerative price to the producers<sup>39</sup>. This plant should also explore possibilities of utilizing their processing capacity using alternative fruits such as mousami. ITC has partnered with PAJL to source kinnow fruits from farmers of Punjab for manufacturing and packing of "B Natural Punjab de

Kinnow" at its state of the art manufacturing facility at Bengaluru<sup>40</sup>. Punjab Agro has received an export order of 200 MT fresh kinnow from Punjab to the United Arab Emirates — fructifying the State Government's efforts to woo foreign investments<sup>41</sup>. Thus state government can play a major role in export of kinnow. Some part of kinnow is exported to Bangladesh through the outlets in Kolkata. In the past kinnow was exported to Russia, Iran and in Gulf countries but these are not regular phenomena. The PAJL plants are often leased out to the private firms like Hindustan lever<sup>42</sup> and Pepsico for producing kinnow concentrate for use in Tropicana range of juices. However, this facility should run on a continuous basis for the benefit of the small and medium farmers.

It is stated that the Punjab Agro Juice Limited with little modification could extract high-value compound, limonene, from kinnow peel, juice and seed. Kinnow is the richest source for limonene known for anti-cancer properties and reducing cholesterol. Against three to five parts per million (ppm) limonene in other citrus fruits, its concentration in kinnow juice is up to 20 ppm. In kinnow seed, it is nearly 2,500 ppm. If some appendages are added to the existing plants to extract seed from the fruit and limonene from kinnow seed, peel and juice, it will not only make the plants viable but also offer better returns to farmers by creating demand for processing of the fruit<sup>43</sup>.

#### *Policy intervention to promote kinnow value chain*

The government is providing subsidies to farmers to incentivize adoption of new technology and enterprises (Table 15). Subsidy of 50% of cost of establishment of nursery is provided with ceiling of Rs 6.25 lakhs. Government is also providing subsidy for establishment of kinnow orchard (75%), irrigation point, collection center, grading and packaging (40%),

Table 15 — Government intervention to improve the value chain and value chain financing

S. No.	Particular	Financial assistance (Rs lakh)	Limit
1	Nursery development	6.25	50% subsidies maximum for 4 ha
2	Kinnow orchard establishment	0.40	75% subsidies (60:20:20)
3	Irrigation (pond)		
	a) Community tank	1.20	100% subsidies maximum 10 ha
	b) Individual		50% subsidies
4	Infrastructure like collection centre, grading and packing, cold storage unit	15.00	Credit linked backup subsidies 40%
5	Processing unit (value addition)	Cost based	35% of actual cost credit linked subsidies

and processing unit (35%). This support help farmers to shift to kinnow and helps in improving kinnow production.

There is a need to upscale the credit flow to whole kinnow value chain by the financial institutions. The contract farming arrangements with farmers, traders/processor/modern retail outlets and commercial banks under tripartite arrangement for financing of the entire value chain of kinnow would help all the stakeholders. Technical guidance and training should be imparted to bank staff for identifying the different value chain and opportunity to finance the kinnow value chain, which is risk free. Kisan credit card limits for provisioning of finance should be increased for kinnow growers. State bank of India has introduced supply chain finance scheme for the benefit of all involved in value chain<sup>44</sup>. The financial institutions should look beyond the direct recipient of finance to better understand the competitiveness and risks involved in kinnow value chain and craft products that best fits the needs of the businesses in chain<sup>35</sup>.

The kinnow sector is facing lot of risk in terms of prices or over production or fall in production. This is resulting in farmers realizing a very low income leading them to even think of leaving the produce in the field or shift to new crop. The crop insurance scheme is one way of absorbing the risk the farmers face. The Pradhan Mantri Fasal Bima Yojna (PMFBY) has provision of crop insurance for horticultural crops at a premium of 5% of sum insured or actuarial rate whichever is low for annual commercial/ annual horticultural crops. Punjab is coming up with its own tailor made crop insurance scheme having rejected the PMFBY<sup>45</sup>. However, it needs to be seen how the new scheme would be for the horticultural crops. Maharashtra government has included three orchard crops namely orange, guava and sweet lime under its weather based crop insurance scheme for 17 districts<sup>46</sup>. There is a need to evolve price stabilization fund scheme for mitigating the woes of the farmers due to fluctuation in prices of kinnow due to bumper harvest, poor exports and low processing<sup>47</sup>.

#### *Other interventions to improve kinnow value chain*

a) Collectivisation of kinnow farmers into producer organization

There is an urgent need to promote kinnow producer organization. This will help stakeholders to develop strategies in their respective areas of strength to take advantage of input and output marketing,

orchard insurance, credit and contractual agreement between farmers and traders/processors. The government should take necessary steps to strengthen the cooperative marketing system/ forming of self-help groups for value-addition and marketing of produce in the distant markets for realizing better prices<sup>4</sup>. The members of FPO realize 13.86% higher gross returns for chilli crop primarily due to FPOs providing access to technology, finance and markets<sup>48</sup>.

b) Orchard tourism

'Kinnow' mandarin has come of its age not only as a fruit with enough benefits but also as a viable tourism proposition. Kinnow tourism in the states of Ganganagar, Rajasthan and Punjab is now a reality and consists of staying in a sprawling Kinnow farms with the sight of orange coloured kinnows dangling from small trees. It is just not only staying amidst Kinnows all around and plucking them as the farmers do but also get enlightened about the ways they are being processed into healthy juices. The sprawling Kinnow farms have added a new dimension to the charm of enjoying a holiday in accordance to the rustic ways of life in Rajasthan and rural Punjab<sup>49,50,51</sup>.

c) Use of successful kinnow entrepreneurs as resource persons for training other kinnow farmers

Karamjeet Kaur Danewalia from Denewala Satkosi village, Abohar, Punjab is honoured as kinnow queen by state government. She created world record of 132.2 tonnes of Kinnow in one hectare. She is trained in California for kinnow processing and packaging (<http://www.kinnowqueen.apnikheti.co.in/>). Mr Surinder Singh from Abohar, Punjab was once a fruit seller and is now the owner of a million dollar business that has branches in over 12 countries (<https://yourstory.com/2017/01/selling-fruits-surinder-singh-has-seen-it-all>). Such innovative and successful entrepreneurs need to be identified and used as resource persons to train kinnow farmers in best practices of production, processing, packaging and marketing.

#### **Conclusion**

The emerging marketing channels (EMCs) are found to have greater marketing efficiency as looked at from the existing tools and techniques of analysing the marketing channels. However, in depth analysis of the same reveals that the traditional marketing channel (TMC) offers 14.69 to 19 per cent higher net

benefit under the situation of price and yield risk associated with the farms. The efficiency of farms associated with strong value chain finance is higher as compared to farms associated with the weak finance value chains comprising the EMCs. These facts explain continued faith of farms in the TMC as revealed by the proportion of farms supplying their produce through different market channels. There is a need to invest in improving marketing infrastructure, adoption of technology, and beneficial policies for the benefit of various stakeholders of the kinnow value chains. It is suggested that the government should take concerted steps for promotion of export of kinnow. It should devise suitable insurance scheme for insuring the kinnow crop against not only yield but more so against price. It should monitor the price of kinnow and moderate it through successfully running the Punjab Agro Juice Limited (PAJL) during the kinnow fruit season. Incentivise investment by private sector to develop cold chain to supply kinnow to the Southern states and also for its export. The formation of FPO should be facilitated to strengthen the bargaining power of the farmers leading to better access to finance, technology and markets. The research institutes like PAU, Ludhiana, IARI, and other private institutes should focus at developing seedless varieties which is more amenable to processing. The banks should recognise the kinnow value chain and devise suitable financial products to finance the same in order to strengthen it. APEDA and NABARD can play a role in strengthening infrastructure facility to improve the kinnow value chain and also help in boosting exports by creating an enabling environment towards meeting the export standards. The progressive farmers should be sent abroad for participation in trade fairs so that they attract foreign customers for boosting exports and also in understanding the importing nations quality standards.

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### References

- Chaba A A, Kinnow expects three fold hike in exports, Feb 9, 2017, Accessed on 19.2.2019 from <https://indianexpress.com/article/india/kinnow-exports-fruits-kinnow-expects-three-fold-hike-in-exports-4514938/>
- Kaur H & Singh I P, Price spread and marketing efficiency of kinnow in Sri Ganganagar district of Rajasthan: A temporal study, *Indian J Agric Market*, 21 (2007) 181-187.
- Bhat A, Kachroo J & Kachroo D, Economic appraisal of kinnow production and its marketing under North-Western Himalayan Region of Jammu, *Agric Econ Res Rev*, 24 (2011) 283-290.
- Mavi H K, Sidhu R S & Sidhu J S, Investigating the efficiency of various marketing models and problems of Kinnow growers of Punjab, *Agric Econ Res Rev*, 25 (1) (2012) 87-97.
- Grover D K, Singh J, Singh J M & Kumar S, An economic analysis of marketing of kinnow in Punjab: emerging vis-a-vis traditional marketing channels, *Agric Update*, 8 (3) (2013) 484-491.
- Alam G & Verma D, *Connecting Small-scale Farmers with Dynamic Markets: A Case Study of a Successful Supply Chain in Uttarakhand*, Centre for Sustainable Development, Dehradun (2007).
- Dhananjaya B N & Rao A U, Namdhari Fresh Limited, In: *Inclusive Value Chains in India – Linking the Smallest Producers at Modern Markets*, Ed: M. Harper (World Scientific, Singapore, Case study 1), Chapter 3, 2009, p.26-41.
- Sulaiman, Rasheed V, Kalaivani N J, Jatinder H, Reddy T S, et al., Organised retailing of fresh fruits and vegetables opportunities for putting research into use, *Research into Use*, 2011, Discussion Paper No 12.
- Birthal P S, Joshi P K & Gulati A, *Vertical Coordination in High-value Food Commodities: Implications for Smallholders*, MTID Discussion Paper No. 85, 2005, IFPRI, Washington.
- Mangala K P & Chengappa P G, A novel agribusiness model for backward linkages with farmers: A case of food retail chain, *Agric Econ Res Rev*, 21 (2008) 363-370.
- Joseph M, Soundarajan N, Gupta M & Sahu S, Impacts of organized retailing on the unorganized sector, ICRIER, Delhi, 2008.
- Aparna B & Hanumanthaiah C V, Are supermarket supply channels more efficient than traditional market channels? *Agric Econ Res Rev*, 25 (2) (2012) 309-316.
- Gulati A, Ganguly K & Landes M, *Toward contract farming in a changing agri-food system*. International Food Policy Research Institute, New Delhi, 2008.
- Kirsten J, & Startorius K, Linking agribusiness and small scale farmers in developing countries: Is there a new role for contract farming? *Development Southern Africa*, 19 (2002) 503-529.
- Reardon T, Timmer C P, Barrett C B & Berdegue J, The rise of supermarkets in Africa, Asia and Latin America, *Am J Agric Econ*, 85 (2003) 1140-1146.
- Little P & Watts M, *Living under contract: Contract farming and agrarian transformation in Sub-Saharan Africa*: Madison: University of Wisconsin Press, 1994.
- Neven D, Odera M M, Reardon T & Wang H, Kenyan supermarkets emerging middle class horticultural farmers, and employment impacts on the rural poor, *World Development*, 37 (11) (2009) 1802-1811.
- Singh S, Contracting out solutions: Political economy of contract farming in the Indian Punjab, *World Development*, 30 (2002) 1621-1638.

- 19 Dey S, Rythu bazaars – A study of the benefits received by farmers, *Asian J Manag Res*, 3 (1) (2012) 220-231. Accessed on 7.2.2019 from [www.researchgate.net/publication/261324417\\_Rythu\\_bazaars\\_-\\_A\\_study\\_of\\_the\\_benefits\\_received\\_by\\_farmers](http://www.researchgate.net/publication/261324417_Rythu_bazaars_-_A_study_of_the_benefits_received_by_farmers)
- 20 Dhumal V D & Raju A D, Shetkari bazar: an alternative to the problems of unorganized vegetable market system in Latur city, *Int J Emerg Trends Sci Technol*, 4 (8) (2017) 5799-5804, DOI: <https://dx.doi.org/10.18535/ijetst/v4i8.55>
- 21 Gowda C S S, Aditya & Kar A, Impact of e-mandi on commodity prices using double difference method, *Agriculture Update* 13(2) (2018) 223-227, DOI: 10.15740/HAS/AU/13.2/223-227
- 22 Ramkumar R, Costs and margins in coconut marketing: some evidence from Kerala, *Indian J Agric Econ*, 56 (4) (2001) 668.
- 23 Prakash P, Jaganathan D, Sivakumar P S, Immanuel S, Kishore P, *et al.*, Does APMC market increase farmer's income? Evidence from value chain analysis of sweet potato in Karnataka, *Indian J Agric Econ*, 73 (3) (2018) 342-357.
- 24 Anonymous, PepsiCo opens citrus greenhouse in Punjab, 2003, Accessed on 19.3.2019 from [https://economictimes.indiatimes.com/articleshow/196699.cms?from=mdr&utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/articleshow/196699.cms?from=mdr&utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)
- 25 Vijay C & Roy V C, Punjab Kinnow farmers face trouble over tube well connections Sept 11, 2014, *Business Standard*, [https://www.business-standard.com/article/economy-policy/punjab-kinnow-farmers-face-trouble-over-tube-well-connections-114091101358\\_1.html](https://www.business-standard.com/article/economy-policy/punjab-kinnow-farmers-face-trouble-over-tube-well-connections-114091101358_1.html)
- 26 Anonymous, Citrus estates societies, 2019. Accessed on 5.2.2019 from [https://www.google.com/search?q=%27citrus+growers+association%27+of+punjab&rlz=1C1CHHM\\_enIN753IN753&ei=mIdZXKecM5rb9QOigLmYDA&start=20&sa=N&ved=0ahUKEwinyK\\_q0aTgAhWabX0KHSJA\\_DsM4ChDy0wMIhgE&biw=1920&bih=888](https://www.google.com/search?q=%27citrus+growers+association%27+of+punjab&rlz=1C1CHHM_enIN753IN753&ei=mIdZXKecM5rb9QOigLmYDA&start=20&sa=N&ved=0ahUKEwinyK_q0aTgAhWabX0KHSJA_DsM4ChDy0wMIhgE&biw=1920&bih=888)
- 27 Awasthi O P & Verma M K, *Kinnow ki kheti: Aek Labhprad vyavsai* (In Hindi) edited by M K Veram & A K Singh, (Division of Fruits and Horticultural Technology, IARI, New Delhi), 2014, p.1-8.
- 28 Thakre M, Verma M K & Awasthi O P, *Kinnow ke bago mein samsamyik prabandhan* (In Hindi), *Prasar Doot*, December, (2015) 36-37.
- 29 Anonymous, Cross pollination: PAU low seeded kinnow scores over Pak variety, 2019. Accessed on 5.2.2019 from <https://indianexpress.com/article/cities/ludhiana/cross-pollination-pau-low-seeded-kinnow-scores-over-pak-variety/>
- 30 Rachna, Post-harvest studies in kinnow mandarin, PhD Thesis submitted to Department of Fruit Science, College of Agriculture, Punjab Agricultural University, Ludhiana, 2013. Accessed on 5.2.2019 from <http://krishikosh.egranth.ac.in/bitstream/1/5810015738/1/PAU-Rachna.pdf>
- 31 PTI, Indo-Israel centre unveiled for citrus growers in Punjab, 2014. Accessed on 5.2.2019 from <https://economictimes.indiatimes.com/news/economy/agriculture/indo-israel-centre-unveiled-for-citrus-growers-in-punjab/articleshow/45228771.cms>
- 32 Anonymous, Lac-based coating formulation for kinnow: A glitter like gold, (2019c). Accessed on 15.03.2019 from <https://iinrg.icar.gov.in/frtcoat.html>
- 33 Mahajan B V C, Kumar M & Swati, Export Marketing of Kinnow Fruits Nov 7, 2017 Cooling India, Accessed on 20.3.2019 from <https://www.coolingindia.in/export-marketing-of-kinnow-fruits-cold-chain-coldstores-refrigerated-vehicles/>
- 34 Anonymous, Organic farming a hit at kisan mela, 2019. Accessed on 45.2.2019 from <https://www.tribuneindia.com/news/punjab/community/organic-farming-a-hit-at-kisan-mela/188627.html>
- 35 Miller C & Jones L, *Agricultural value chain finance- tools and lessons*, Published by Food and Agricultural Organisation of the United Nations and Practical Action Publishing Ltd, UK. 2010.
- 36 Sodhi M M S, Singh S & Agnihotri C, Cold chain development for fruits and vegetables in India-kinnow cold chain study, Study report, ISB Munjal Institute for Global Manufacturing and National Centre for Cold Chain Development, 2016. Accessed on 15.3.2019 from <https://www.nccd.gov.in/PDF/Kinnow-PILOT-Report.pdf>
- 37 Anonymous, Punjab targets to compete Pakistan on kinnow export, 2017. Accessed on 19.3.2019 from <https://www.thestatesman.com/cities/punjab-targets-to-compete-pakistan-on-kinnow-export-1486193775.html>
- 38 Arora K, Kinnows get more citrus through e-marketing app, 2019. <https://dailypost.in/news/chandigarh/kinnow-orchards-no-lucrative-farmers/>
- 39 Gangwar L S, Singh D & Singh D B, Estimation of post-harvest losses in kinnow mandarin in Punjab using a modified formula. *Agricultural Economics Research Review*, 20 (2) (2007) 315-331.
- 40 Anonymous, ITC foods B natural's new Punjab da kinnow all set to delight consumers, 2016. accessed on 15.3.2019 from <https://www.itcportal.com/media-centre/press-reports-content.aspx?id=1693&type=C&news=ITC-Foods-B-Naturals-new-Punjab-da-Kinnow-all-set-to-delight-consumers>
- 41 Anonymous, Punjab agro gets export order of 200 MT kinnow from Dubai's Lulu group, 2019. Accessed on 15.3.2019 from <https://m.dailyhunt.in/news/india/english/5+dariya+news+english-epaper-dariyaen/punjab+agro+gets+export+order+of+200+mt+kinnow+from+dubai+based+lulu+group+newsid-105482070>
- 42 Kaur H, Fruit processing plants leave bitter taste in grower's mouth, *Hindustan Times*, 16<sup>th</sup> Feb 2012. Accessed on 15.3.2019 from <https://www.pressreader.com/india/hindustan-times-jalandhar/20120216/283390533773587>
- 43 Kaur S, Horticulture dept differs, govt sets disinvestment ball rolling Nov 25, 2010, Accessed on 19.3.2019 from <http://archive.indianexpress.com/news/horticulture-dept-differs-govt-sets-disinvestment-ball-rolling/715558/>
- 44 Anonymous, SBI plans to grow SME lending by 10-12%, 2016. Accessed on 15.3.2019 from [https://economictimes.indiatimes.com/articleshow/54374913.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/articleshow/54374913.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)
- 45 Mohan V, Punjab set to roll out its own crop insurance scheme shortly, Aug 18, 2018, Times of India, Accessed on 16.3.2019 from [http://timesofindia.indiatimes.com/articleshow/65445983.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](http://timesofindia.indiatimes.com/articleshow/65445983.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)
- 46 Pallavi A, Maharashtra's insurance scheme for orchard owners draws angry protests, 4<sup>th</sup> July, 2015, Down To Earth, <https://www.downtoearth.org.in/news/maharashtras-insurance-scheme-for-orchard-owners-draws-angry-protests---44685>

- 46 Varkey L M & Kumar P, Price risk management and access to finance for rubber growers: The case of price stabilization fund in Kerala, *Indian J Agric Econ*, 66 (1) (2013) 65-88.
- 47 Manaswi B H, Pramod Kumar, Prakash P, Amit Kar, Anbukkani P *et al*, Impact of Farmer Producer Organizations on accessing technology, finance and market: A case study of organic chilli producers of Telangana, *Indian J Agric Sci*, 89 (11), (2019) 1850-1854.
- 48 Awasthi O P, Singh A K & Verma M K, Orchard Tourism as an Enterprise rises, In: Horticulture for Environment and Ecotourism, Ist Edition, edited by Jankiram, (Division of Floriculture and Landscaping, IARI, New Delhi), 2013. Accessed on 19.3.2019 from file:///C:/Users/microsoft/ Contacts/Downloads/ Orchard tourism enterprises.pdf
- 49 Raja V, Punjab grad reinvents 'citrus tourism' to give farm a second life, 2018. Accessed on 5.2.2019 from <https://www.thebetterindia.com/168252/punjab-farmer-innovation-agro-tourism-india/>
- 50 Gaurav, Farm tourism in Punjab, December 30, 2015, Accessed on 19.3.2019 from <http://thespunkyttraveler.com/2015/12/farm-tourism-in-punjab/>
- 51 GoP, Statistical abstracts of Punjab, Economic and Statistical Organization, Government of Punjab, 2016.